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The Occurrence of Cork between the Annual Layers in the Stem of Catalpa speciosa, Warder.

BY C. R. BARNES.

Mr. W. H. Ragan, Secretary of the Mississippi Valley Horticultural Society, handed to me recently a small section of *Catalpa speciosa* (fig. 4), grown from the seed by A. H. Gaston, at Lacon, Ill. The specimen was cut from the lower end of a tree three years old, and was intended to show the great rapidity of growth of this species. Truly the growth had been rapid, as the following measurements show:

First year's growth, average radius, 7.5mm
Second " " " thickness, 12.5mm
Third " " " " 11.5mm
Bark " " 3mm
Average diameter of stem, 67.5mm

But the rapidity of growth is by no means the most remarkable feature of this specimen. The yearly rings are separated by zones, more or less complete, of cork tissue. Around the first year's growth the cork zone (*a*, fig. 4) is narrow but continuous, and is traversed by numerous medullary plates. Around the second year's growth the cork zone (*b*, *c*, *d*, *e*, fig. 4) is of greater width, in places, but is not continuous. By the aid of a lens, the more prominent medullary plates may be seen to traverse this outer cork zone. The second year's growth shows (more distinctly since oiling the section with linseed oil) three truncated wedges (*f*, *g*, *h*, fig. 4) appearing darker than the rest of the wood, and occupying about 30° of the circles which form their central and peripheral ends.* The portions of the cork zone opposite these areas are considerably wider than elsewhere, as shown at *c*, *d* and *e*, fig. 4. At *e* the thickness amounts to 2.8^{mm}. Just beyond *e* the cork zone tapers out quite abruptly, and from this point to the edge of the removed sector is entirely absent, the difference between the annual layers being here marked only by the difference in the texture of the spring and autumn wood. This gap in the zone (at *i*, fig. 4) occurs opposite to the area which should be occupied by a fourth wedge (corresponding to *g*, fig. 4), were it present.

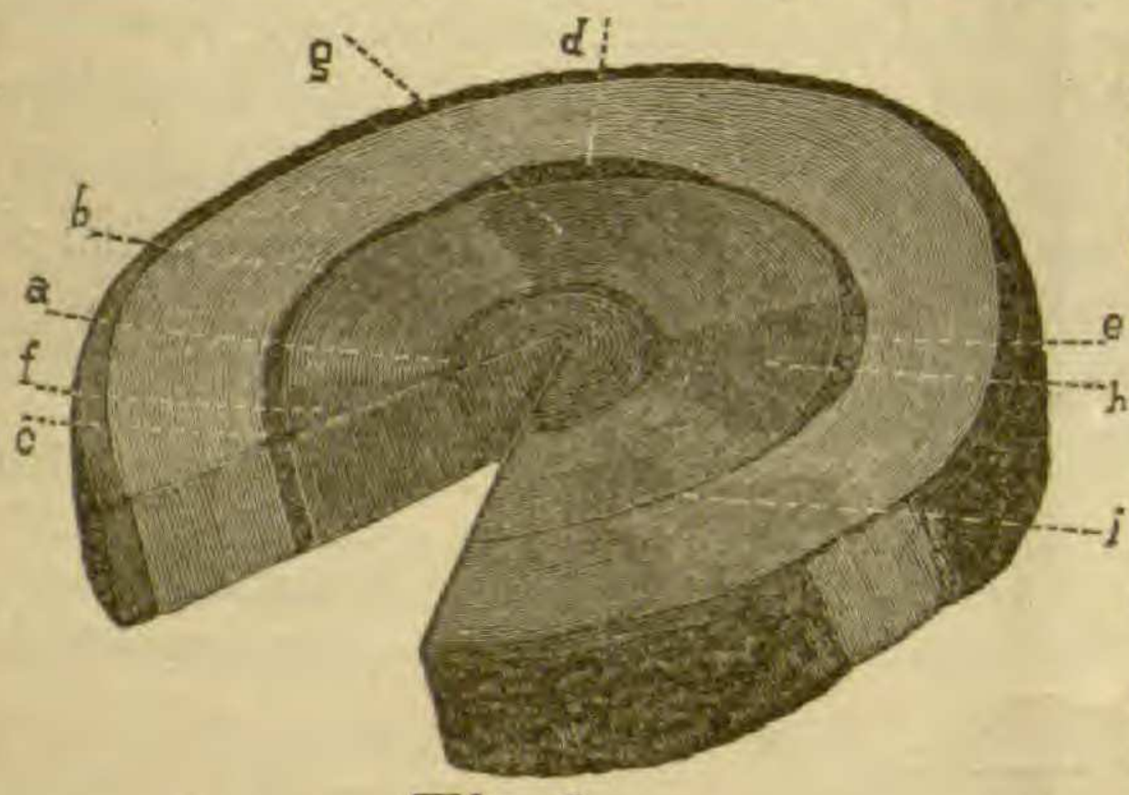

Fig. 4.

Although these zones which have been described had every appearance of cork, I could hardly believe that cork could occur in such an anomalous place. Having cut transverse sections of the tissue in question (near *c*, fig. 4) and part of the adjacent wood on each side, I submitted some to the prolonged action of c. p. sulphuric acid and treated others with an ammoniacal solution of copper oxide.† In both cases the tissue remained unchanged. In the first case the wood cells (excepting the middle lamella) were dissolved. In the second case the whole section

[*I have not been able to discover any difference in structure between these wedges and the intervening wood, and am unable to account for their presence, unless they be three of four normal (?) groups of fibro-vascular bundles, indicating kinship with *Bignonia capreolata*.]

†Poulsen's Bot. Mikrochemie, Germ. tr. by Müller, pp. 14, 16 and 61.

was unchanged. Both reagents when applied to cotton fibers quickly destroyed them.

Figs. 1 and 2, Plate I, represent transverse sections, and fig. 3 a longitudinal radial section of this tissue, taken near *c*, fig. 4. The transition between the wood cells centrad of the cork and the cork cells is remarkably abrupt (fig 1). On the peripheral side of the cork there is no such abruptness, the cork cells, *c*, *c*, *c*, fig. 2, shading imperceptibly into the wood cells, *x*, *x*.

In all the sections the cork cells are seen to be quite irregular, much more than this tissue normally is. Some sections from other parts of the stem showed a more regular tissue ; in several instances radial series of rectangular cells were observed, though fig. 1 is about the average as to regularity.

The wood cells last formed in autumn are quite different from the earlier ones. In fig. 1 the last .12^{mm} of wood cells (from *a* to *b*) are thicker walled and have less angular cavities than the older portion. In fig. 3 the difference is still more marked, the wood from *a* to *b* consisting of greatly elongated fibers with irregularly thickened walls ; whereas the majority of the wood consists of shorter, smooth-walled fibers with oblique ends (*x*, fig. 3).

I am unable to present any satisfactory explanation of the formation of cork in the positions described. Numerous theories have suggested themselves, but all are open to too grave objections to be worth presenting.

EXPLANATION OF PLATE.—Figs. 1 and 2. Transverse sections of a portion of the stem of *Catalpa speciosa*, Warder.

Fig. 3. Longitudinal radial section of the same.

The reference letters are the same in all the figures.

c, cork cells ; *C*, central side of the section ; *m*, cell of medullary ray, with pitted walls ; *p*, large pitted vessel ; *P*, peripheral side of the section ; *x*, smooth walled wood fibers ; x^1, younger wood fibers with irregularly thickened walls.

All the figures were drawn with a camera, under Beck's ¼ objective and A eyepiece.

GENERAL NOTES.

A New Aristida.—ARISTIDA BASIRAMEA, Engelmann in a letter to W. Upham.—Annual: culms erect, 6 to 15 inches high, slender, much branched at the base (some of the branches very short but floriferous), and with short floriferous branches enclosed in the upper leaf sheaths: leaves comparatively long (3 to 6 inches), narrowly linear, flat, becoming involute toward the apex, sparsely hairy on the margins below, the upper ones nearly equaling the panicle ; sheaths striate, loose ; ligule very short, truncate : panicle 1½ to 3 inches long erect, rather lax, its base sheathed by the upper leaf ; branches of the panicle